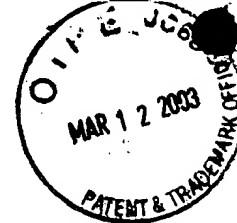




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Immunology



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Antigen Interactions

Antigen-Antibody Interactions

- Antigen-antibody interactions involve **reversible** formation of **multiple noncovalent bonds** between epitope and paratope
 - The **spatial complementarity** required is based upon the **electron cloud shapes** of both epitope and paratope<>
 - Overall epitope and paratope **configuration**, which determines the **availability of electrons for interaction**, is more important than the nature of the atoms involved (e.g., note the cross-reactivity of benzoate, phenylarsonate and benzenesulfonate with antibodies prepared against benzenesulfonate)<>
 - The **lock and key relationship** between epitope and paratope is enhanced by **induced fit** (~1 angstrom at the peptide backbone level, and more at the side chain level) due to their **mutually deformable conformations**
- Intermolecular interactions between side chains of epitope subunits and those of the paratope include these **noncovalent interactions**
 - Electrostatic interactions
 - oppositely charged ionic groups, such as carboxyl and amino groups, attract each other<>
 - force of these interactions is **inversely proportional to the square of the distance between the charges**
 - mutual attractiveness between them increases exponentially as the charged groups come closer together<>
 - **displacement of water molecules**, with their high dielectric constant, increases the force of these interactions
 - Hydrogen-bonding
 - **reversible hydrogen bridges** between hydrophilic (hydroxyl, amino and carboxyl) groups<>
 - **relatively weak, essentially electrostatic interactions** that are enhanced by displacement of water molecules<>
 - Van der Waal's forces
 - depend upon **interaction between external electron clouds** that lead to **induced dipole interactions**<>